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10/036,016	12/26/2001	Ahmad Said Ghazal	9983	2452

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EXAMINER

WU, YICUN

ART UNIT PAPER NUMBER

2165

DATE MAILED: 03/07/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/036,016

Applicant(s)

GHAZAL ET AL.

Examiner

Yicun Wu

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 October 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-49 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 17 is/are allowed.
- 6) ☒ Claim(s) 1-13, 16, 18-30, 33-46 and 49 is/are rejected.
- 7) ☒ Claim(s) 14, 15, 31, 32, 47 and 48 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

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III. DETAILED ACTION

1. Claims 1-49 are presented for examination.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-13, 16, 18-30, 33-46 and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zait et al. (U.S. Patent 6,609,131) in view of Liu et al. (U.S. Patent 6,263,331).

As to Claims 1, 18 and 34, Zait et al. discloses a method of joining a first table t, and a second table t2, each table containing rows and columns and being divided into one or more partitions, the method including:

(a) calculating a correlation function (i.e. join. Col. 7, lines 7-12) between a first correlated value column (i.e. productid. Col. 7, lines 7-12) of table t (i.e. sales. Col. 7, lines 7-12), and a second correlated value column (i.e.

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productid. Col. 7, lines 7-12) of table t2 (i.e. product. Col. 7, lines 7-12);

(b) receiving a query requesting a join between table t1 and table t2 (i.e. join. Col. 7, lines 7-12); and

(c) performing a joining (i.e. join. Col. 7, lines 7-12), wherein the partitions containing the rows to be joined are determined based at least in part upon the correlation function (i.e. join. Col. 7, lines 7-12).

Zait et al. does not explicitly teach a algorithm.

Liu et al. teaches a algorithm (i.e. algorithm col. 4, lines 22-25).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to have modified Zait et al. with algorithm.

It would have been obvious to a person having ordinary skill in the art at the time the invention was made to have modified Zait et al. by the teaching of Liu et al. because providing algorithm allows the reduces minimizes processor and I/O costs as taught by Liu et al. (col. 3, lines 4-5).

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As to Claims 2, 19 and 35, Zait et al. as modified teaches a method wherein (b) occurs before (a). (i.e. join. Zait et al. Col. 7, lines 7-12).

As to Claims 3, 20 and 36, Zait et al. as modified teaches a method wherein the joining algorithm comprises:

(c1) calculating, based at least in part upon the correlation function, a first number f1 and a second number f2, wherein f1 and f2 denote the number of partitions of table t1 (i.e. sales. Zait et al. Col. 7, lines 7-12) and table t2 (i.e. product. Zait et al. Col. 7, lines 7-12), respectively, to be joined (i.e. join. Zait et al. Col. 7, lines 7-12);

(c2) determining, based at least in part upon the correlation function (i.e. join. Zait et al. Col. 7, lines 7-12), a first starting partition number P1 (i.e. sales. Zait et al. Col. 6, lines 36-49) for table t1 and a second starting partition number P2 for table t2 (Zait et al. fig. 2);

(c3) joining a set of f2 partitions of table t2 starting at P2 with a set of f1 partitions of table t1 starting at P1 (i.e. partition-wise join. Zait et al. col. 7, lines 40-45);

(c4) updating P1 and P2 (i.e. partition-wise join. Zait et al. col. 7, lines 40-55).

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As to Claims 4, 21 and 37, Zait et al. as modified teaches a method wherein

(c3) and (c4.) are repeated while at least one table has at least one active, non-eliminated partition (i.e. repeat for each partition. Zait et al. col. 7, lines 40-55).

As to Claims 5, 22 and 38, Zait et al. as modified teaches a method 5, wherein

the f2 partitions to be joined in (c3) are contiguous (Zait et al. col. 7, lines 40-55).

As to Claims 6, 23 and 39, Zait et al. as modified teaches a method wherein

the f1 partitions to be joined in (c3) are contiguous (Zait et al. col. 7, lines 40-55).

As to Claims 7, 24 and 40, Zait et al. as modified teaches a method wherein

the f2 partitions to be joined in (c3) are not contiguous (Zait et al. col. 7, lines 40-55).

As to Claims 8, 25 and 41, Zait et al. as modified teaches a method wherein

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the f1 partitions to be joined in (c3) are not contiguous (Zait et al. col. 7, lines 40-55).

As to Claims 9, 26 and 42, Zait et al. as modified teaches a method wherein the span of the f, partitions in table t1 and the span of the f2 partitions in table t2 to be joined in (c3) are increased, the method further comprises:

(c31) setting a parameter cps equal to the minimum number of inactive or eliminated partitions in (i) the span of f1 partitions in table t1 beginning at P1 and in (ii) the span of f2 partitions of table t2 beginning at P2 (dynamically partitioning. Zait et al. Col. 9, lines 43-48);

(c32) increasing the value of f2 by eps (dynamically partitioning. Zait et al. Col. 9, lines 43-48);

(c33) increasing the value of f, by eps (dynamically. Zait et al. Col. 9, lines 43-48); and

(c34) after performing (c4), resetting the value of f2 equal to the value of f2 calculated in (c1) and resetting the value of f1 equal to the value of f1 calculated in (c1) (dynamically partitioning. Zait et al. Col. 9, lines 43-48).

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As to Claims 10, 27 and 43, Zait et al. as modified teaches a method wherein

(c31), (c32), and (c33) are repeated if some of the partitions added in the preceding iteration of (c31), (c32), and (c33) are empty (dynamically partitioning. Zait et al. Col. 9, lines 43-48).

As to Claims 11, 28 and 44, Zait et al. as modified teaches a method wherein the span of the f, partitions in table t, and the span of the f2 partitions in table t2 to be joined in (c3) is increased, the method further comprises:

(c31) setting a parameter cps equal to the result of the function $\text{FLOOR}(x/2)$, wherein x is a sum of the number of inactive or eliminated partitions in the span of f1 partitions in table t1 beginning at P, and the span of f2 partitions in table t2 beginning at P2, and $\text{FLOOR}(x/2)$ returns a largest integer that is less than or equal to $x/2$ (dynamically partitioning. Zait et al. Col. 9, lines 43-48);

(c32) increasing the value of f2 by eps (dynamically partitioning. Zait et al. Col. 9, lines 43-48);

(c33) increasing the value of f, by eps (dynamically partitioning. Zait et al. Col. 9, lines 43-48); and

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(c34) after performing (c4), resetting the value of f2 equal to the value of f2 calculated in (e1) and resetting the value of f, equal to the value of f1 calculated in (c 1) (dynamically partitioning. Zait et al. Col. 9, lines 43-48).

As to Claims 12, 29 and 45, Zait et al. as modified teaches a method wherein (c31), (c32), and (c33) are repeated if some of the partitions added in the preceding iteration of (c31), (c32), and (c33) are empty (dynamically partitioning. Zait et al. Col. 9, lines 43-48).

As to Claims 13, 30 and 46, Zait et al. as modified teaches a method wherein calculating the correlation function includes:

joining table ti to table t2 using PK=FK as the join condition to produce a join result having rows (i.e. join. Zait et al. Col. 7, lines 7-12), each row including a value from cv1 and a value from cv2, wherein PK denotes a primary key column in table t1, FK denotes a foreign key column in table t2, cv, denotes a first correlated value column in table ti, and cv2, denotes a second correlated value column in table t2 (i.e. join. Zait et al. Col. 7, lines 7-12;

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creating an initial running constraint (RC), the initial running constraint comprising a null range (Zait et al. col. 7, lines 58-67); and

producing a derived constraint rule (DCR) having the following form:

$(PK = FK) \text{ CV2} + c1 \leq \text{CV 1} \leq \text{CV2} + c2$, where $c1$ and $c2$ are constants, and " $-->$ " means "implies" (Zait et al. col. 8, lines 1-9 and col. 11, lines 25-40),

by performing the following processing for each row in the join result:

computing a new constraint (NEW), having a range (col. 8, lines 1-9 and col. 11, lines 25-40); and

modifying RC by merging the range of NEW with the range of RC (Zait et al. col. 8, lines 1-9 and col. 11, lines 25-40).

As to Claims 16, 33 and 49, Zait et al. as modified teaches a method wherein the joining algorithm includes:

(c1) creating a file context, which stores at least location data for a row and a first value associated with the row, for each partition of the set of partitions to be joined (Zait et al. col. 8, lines 1-9 and col. 11, lines 25-40);

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(c2) determining the lowest first value stored by the file contexts that is equal to or greater than a particular hash value Zait et al. col. 8, lines 1-9 and col. 11, lines 25-40); and

(c3) identifying rows with a particular first value by reading the file contexts (Zait et al. col. 8, lines 1-9 and col. 11, lines 25-40).

Allowable subject Matter

4. Claims 17 is allowed over the prior art made of record.

5. Claims 14-15, 31-32 and 47-48 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

6. The following is a statement of reasons for the indication of allowable subject matter:

The prior art of record (Zait et al. (U.S. Patent 6,609,131) and Liu et al. (U.S. Patent 6,263,331).) does not disclose, teach or suggest the claimed limitations of (in combination with all other features in the claims): pct is set equal to the value of $(\text{SIGN}(c2) * \text{CEILING}(\text{ABS}(c2)/p))$, wherein $\text{SIGN}(c2)$ returns a value of -1 if $c2$ is less than zero, otherwise $\text{SIGN}(c2)$ returns a value of 1, $\text{ABS}(c2)$ returns an absolute value of $c2$, and

$\text{CEILING}(\text{ABS}(c2)/p)$ returns a smallest integer that is not less than the value of $\text{ABS}(c2)/p$;

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n is set equal to $pct - pcl + 1$, wherein n is a number of contiguous partitions in table t1 that may have rows matching rows in a single partition of table t2;

m is a maximum number of file contexts;

f2 is set equal to the smallest integer value that is equal to or greater than the value of $((m-n)/2)$;

f1 is set equal to $n + f2 - 1$;

(c2) determining, based at least in part upon the correlation function, a first starting partition number P1 for table t1 and a second starting partition number P2 for table t2, wherein:

P2 is set equal to a lowest partition number in table t2 such that P2 is a first active, non-eliminated partition in table t2, and at least one of the partitions in the interval between $P2 - pct$ and P2 in table t1 is an active, non-eliminated partition;

P1 is set equal to $P2 - pct$;

(c3) joining a set of f2 partitions of table t2 starting at P2 with a set of f1 partitions of table t1 starting at P1;

(c4) updating P1 and P2, wherein:

P2 is set equal to a lowest partition number P2' in table t2, wherein:

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the lowest partition number $P2'$ is greater than or equal to the sum of $PZ + f2$;

PZ' is a first active, non-eliminated partition;

at least one of the partitions in the interval between $P2'' - pct$ and $PZ - pci$ in table $t1$ is an active, non-eliminated partition; and PI is set equal to $PZ' - pc2$, as claimed in claim 14, 31 and 47.

The prior art of record (Zait et al. (U.S. Patent 6,609,131) and Liu et al. (U.S. Patent 6,263,331).) does not disclose, teach or suggest the claimed limitations of (in combination with all other features in the claims):

setting n equal to $pct - pcl + 1$;

determining a parameter m , which is a maximum number of file contexts;

setting $f2$ equal to the smallest integer value that is equal to or greater than the value of $((m-n)/2)$; and
setting $f1$ equal to $n + f2 - 1$

(d) determining a first starting partition number $P1$ for table $t1$ and a second starting partition number PZ for table $t2$, wherein P , and PZ are calculated by setting PZ equal to a lowest partition number in $t2$ such that PZ is a first active, non-

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eliminated partition in table t2, and at least one of the partitions in

the interval between PZ - pct and PZ - pcl in table t1 is an active, non-eliminated partition; and

setting P1 equal to PZ - pct;

(e) performing a joining algorithm, wherein a set of f2 partitions of table t2 starting at PZ are joined with a set of f1 partitions of table t1 starting at P1, wherein the joining algorithm

includes:

creating a file context, which stores at least location data for a row and a first value associated with the row, for each partition of the set of partitions to be joined;

determining the lowest first value stored by the file contexts that is equal to or greater than a particular hash value; and

identifying rows with a particular first value by reading the file contexts;

(f) updating P1 and P2, wherein the updating P1 and P2 includes:

finding a lowest partition number P, ' in t2 that is greater than or equal to the sum of P2 + f2 such that PZ" is a first active, non-eliminated partition, and at least one of the

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partitions in the interval between $P_z - pcz$ and $P_z'' - pcl$ in table $t1$ is an active, non-eliminated partition;

setting PZ equal to PZ ; and

setting $P1$ equal to $PZ' - pct$; and

(g) repeating steps (e)-(f) while at least one table has at least one active, non-eliminated partition, as claimed in claim 17.

Other Prior Art Made of Record

6. The prior art made of record and not relied upon is considered pertinent to Applicant's disclosure. U.S. patents and U.S. patent application publications will not be supplied with Office actions.

Examiners advises the Applicant that the cited U.S. patents and patent application publications are available for download via the Office's PAIR. As an alternate source, all U.S. patents and patent application publications are available on the USPTO web site (www.uspto.gov <<http://www.uspto.gov/>>), from the Office of Public Records and from commercial sources. For the use of the Office's PAIR system, Applicants may refer to the Electronic Business Center (EBC) at [<http://www.uspto.gov/ebc/index.html>](http://www.uspto.gov/ebc/index.html) or 1-866-217-9197.

(U.S. Patent No. 6,,);

(U.S. Patent No. 6,,); and

(U.S. Patent No. 6,,);

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Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Yicun Wu whose telephone number is 571-272-4087. The examiner can normally be reached on 8:00 am to 4:30 pm, Monday -Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dov Popovici can be reached on 571-272-4083. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 571-272-2100.

C. Rones

**CHARLES RONES
PRIMARY EXAMINER**

**CHARLES RONES
PRIMARY EXAMINER**

Yicun Wu
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February 28, 2005